
Determination of Findings Report

PUGET SOUND NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY
BREMERTON WASHINGTON



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Puget Sound Naval Shipyard and Intermediate Maintenance Facility

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(1) CD-ROM containing referenced documents and related applicable information.

Introduction

This report is an initial task from Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS&IMF) under the statement of work titled All Known, Available, and Reasonable Methods of Treatment (AKART) Study. AKART is a Washington Department of Ecology (Ecology) concept that represents the most current methods of preventing, controlling, or abating the pollutants associated with a discharge that can be installed or used at a reasonable cost. The ultimate project is to develop an AKART Study; however, to complete this study significant amounts of data and information must be reviewed and processed. The goal of this report is to organize a portion of that data and information to help direct and support the AKART Study. Specifically Naval Facilities Engineering Command (NAVFAC) Northwest's tasking is to "review the available data and documentation to verify applicable stormwater data as it pertains to regulatory requirements and will provide extrapolated data conclusions for PSNS&IMF." Additionally the data and information will be "invaluable for defining the current stormwater management at the PSNS and will be used to compare practices implemented at other shipyards."

Stormwater-Related Permits

Per Ecology guidelines, one method of defining AKART for a specific facility is consideration of the treatment performance of a similar facility or group of similar facilities. This section identifies and elaborates on stormwater related permits at facilities similar to PSNS&IMF and presents information that will be used to help define AKART for PSNS&IMF.

Stormwater discharges both from dry docks and general yard areas were considered because, while dry dock discharges may be commingled with other discharges, such as vessel non-contact cooling water, a significant component may be stormwater. Looking at the dry docks may be instructive in that chemical-specific permit limits are typically implemented and may over time be implemented for general yard stormwater discharges. While the industrial operations conducted in a dry dock may be more concentrated than that conducted in a general yard area, the operations are generally similar.

Six facilities and three general permits were selected for evaluation. The three general permits selected were the Washington State Boatyard General Permit (Ecology 2005), Washington State Industrial Stormwater General Permit (Ecology 2007) and EPA's Multi-Sector General Permit (MSGP) (EPA 2000). Table 1 summarizes basic information for each facility/permit evaluated.

The facilities were selected based on a number of factors as follows:

- Facility Size: Since PSNS&IMF is a large facility, similar large facilities were also selected as much as possible. Facility size was mainly based on the number of dry docks. A facility with:
 - Zero to two dry docks is considered a small facility.
 - Three to four dry docks is considered a medium facility.
 - More than four dry docks is considered a large facility.

For the general permits the above size definitions are not applicable. Since the Washington State Boatyard General Permit, facilities with this permit are only applicable to boatyards that service smaller vessels (<65 ft.) considered as "small facilities." EPA's MSGP applies to a wide variety of industrial facility types but was selected because it specifically applies to stormwater discharges from "Ship and Boat Building or Repair Yards [Sector R]." Applicability of Sector R is based on the US Office of Management and Budget's Standard Industrial Classification (SIC) Manual – SIC codes 3731, Ship Building and Repairing and 3731, Boat Building and Repairing. While the SIC manual is not specific to the size of facility it reasonably would include all the facilities in Table 1. Ecology's draft Industrial Stormwater General Permit is Washington State's (Washington 2007) equivalent to EPA's MSGP. The industrial General Permit applies to a wide variety of industries; however it does not apply to shipyards/boatyards. Boatyards in Washington obtain stormwater coverage under the Boatyard General Permit. Shipyards must obtain coverage under an individual permit. The size definition in Table 1 is not applicable. The permit was included since it has some interesting conditions that may foreshadow the direction of future permits.

Information gleaned from small and medium facilities are useful since:

- There are not very many large facilities, particularly in Washington. The overall usefulness of the evaluation would be limited if it only focused on large facilities. Including small and medium facilities provides a greater depth of information.
- Implementation of stormwater pollution controls at small and medium facilities may act as a bellwether for what is to come for larger facilities. Identification of AKART for small and medium facilities may relate to what AKART is or will be for larger facilities.
- Location: For comparative purposes (and therefore inclusion in Table 1) facilities in Washington State were given greater priority than those out-of-state. AKART is an Ecology defined and implemented principal. The details of how AKART were implemented at other in-state facilities directly relates to how it might be implemented at PSNS&IMF. Since nationwide there are not too many facilities the size of PSNS&IMF, a number of large out-of-state facilities were included in Table 1.
- Statement of work: The project Statement of Work states that NAVFAC Northwest should perform "a comparison study with up to four other shipyards." The Statement of Work lists the following candidate shipyards:
 - Cascade General Portland Shipyard, Portland Oregon
 - Electric Boat Shipyard, Groton Connecticut
 - National Steel and Shipbuilding Company, San Diego California
 - Newport News Shipbuilding and Drydock Company, Newport News Virginia
 - Norfolk Naval Shipyard, Portsmouth Virginia
 - Todd Pacific Shipyards Corporation, Seattle Washington

While both Norfolk Naval Shipyard and Newport News were evaluated, only Norfolk is included. This is because Virginia strives to maintain a level of

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equality in permits issued to similar types of industrial facilities, so both the Norfolk Shipyard and Newport News permits are substantially similar.

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Table 1: Basic Facility and NPDES Permit Information

Facility	PSNS&IMF	Ecology Boatyard General Permit (Washington 2007)	Ecology Draft Industrial Stormwater General Permit (Washington 2007)	EPA MSGP (EPA 2000)	Cascade General Portland Shipyard	Electric Boat Shipyard	NASSCO – General Dynamics	Norfolk Naval Shipyard	Todd Shipyard
City	Bremerton	NA	NA	NA	Portland	Groton	San Diego	Norfolk	Seattle
State	WA	WA	Washington	NA	OR	CT	CA	VA	WA
Permit #	WA-000206-2	WAG-030000	NA [Public Notice Draft]	WAR05000F	101393	CT0003824	CA0109134	VA0005215	WA-000261-5
Effective Date	1 April 1994	2 December 2005	NA	30 October 2000	31 Mar 2004	4 July 2006	5 February 2003	25 April 2005	1 October 2002
Permit Authority	EPA Region X	WDOE	WDOE	EPA	ORDEQ	CTDEP	CRWQCB	VADEQ	WDOE
Receiving Water	Sinclair Inlet (MW)	NA	NA	NA	Willamette River (FW)	Thames River (FW)	San Diego Bay (MW)	Elizabeth River (FW) Paradise Creek (FW)	Elliot Bay (MW) Duwamish West Waterway
Number of Dry Docks	6	NA	NA	NA	2	3	2 (and two shipways)	8	3
Facility Size	Large	Small	NA	NA	Small	Medium	Medium (due to the shipbuilding ways)	Large	Medium
WDOE Washington Department of Ecology ORDEQ Oregon Department of Environmental Quality CTDEP Connecticut Department of Environmental Protection VADEQ Virginia Department of Environmental Quality CRWQCB California Regional Water Quality Control Board MW Marine Water FW Fresh Water									

Table 2 outlines stormwater and dry dock monitoring for the facilities addressed in this report. Monitoring of dry dock effluent is included if it was associated with stormwater discharges from a dry dock. Table 2 does not comprehensively include all required monitoring as may be specified in National Pollutant Discharge Elimination System (NPDES) permit(s). Only those parameters that are commonly associated with shipyards and/or may be problematic in terms of compliance were included. The Ecology Boatyard Study (Ecology 2006) states: "... boatyard-related chemicals with the greatest potential for adverse effects in the receiving waters are copper, zinc, lead, tributyltin, polyaromatic hydrocarbons (PAHs), and phthalate plasticizers." PAHs are somewhat captured in Table 2 thru the more common parameters of Oil & Grease and Total Petroleum Hydrocarbons (TPH).

None of the permits reviewed included limits on phthalates and it was therefore not included. Some facilities include multiple permits: one for dry dock discharges and one, a general permit, for general yard stormwater discharges. If applicable this is stated below in the facility/permit description. Notes about each facility and general permit are below:

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PSNS&IMF is located in Bremerton Washington and holds NPDES permit WA-000206-2 issued by the EPA. The permit does not impose limits on general yard stormwater discharges. Stormwater sampling was required in the first two years of the currently effective permit. The parameters varied by outfall and included metals but not toxicity. The dry dock discharge may contain stormwater and it is limited by the NPDES permit. The dry docks are equipped to discharge stormwater into the sanitary sewer to help ensure copper permit limits are achieved. The permit required monitoring the dry dock discharges for lead, mercury, zinc, and toxicity (whole effluent toxicity (WET)) during the first year after issuance. This requirement was met and the monitoring is now discontinued.

EPA Multi-Sector General Permit (MSGP)

The official title of the permit is the NPDES Storm Water Multi-Sector General Permit for Industrial Activities (EPA 2000). EPA reissues the permit roughly every five years. The permit consulted in this report is the October 2000 release. The permit authorizes discharge of stormwater associated with industrial activity for 29 types of industrial operations/facilities (referred to as "sectors"). Sector R is the designation for Ship and Boat Building or Repair Yards. While Sector R imposes specific BMPs it does not require stormwater monitoring. [Interestingly Sector Q, Water Transportation (a somewhat related industry), requires monitoring and specifies benchmark values for aluminum, iron, lead, and zinc.] The benchmark values noted in Table 2 are not directly applicable since no monitoring is required. They are, however, instructive in relaying at what pollutant levels EPA considers significant.

If stormwater monitoring results exceed a benchmark level the permittee is required to try to reduce future levels; however, the permit does not dictate a corrective course-of-action or impose additional requirements/BMPs if this is not accomplished. As such the benchmark values are true benchmarks.

The EPA derived benchmark values are from a variety of sources and they may not be technically applicable for a specific discharge. For instance, the copper benchmark is based on the analytical detection limit. The zinc benchmark is based on the EPA acute aquatic life freshwater water quality criteria. The copper benchmark is independent of potential aquatic impact, and the zinc benchmark is not applicable to marine discharges.

Ecology Boatyard General Permit

Ecology issued this permit on November 2, 2005. The permit applies to all commercial boatyards in Washington that are "engaged in the construction, repair and maintenance of small vessels, 85% of which are 65 feet or less in length, or revenues from which constitute more than 85% of gross receipts." Ecology issues individual NPDES permits for larger boatyards/shipyards (those exceeding the above noted criteria). Generally, individual NPDES permits for shipyards are stricter than the general permit (personal communication w/Donna Ortiz, Ecology, 5/14/07). The limits/benchmark values in Table 2 shown are for existing facilities which discharge stormwater into marine waters. The permit includes alternate limits/benchmarks for discharges into lakes, freshwater, or infiltration into groundwater. The marine water limits were chosen (included in Table 2) since PSNS&IMF discharges into marine water.

If stormwater monitoring results exceed benchmark values the permit imposes a tiered response. The first tiered response is to conduct an inspection and complete actions to try to reduce levels. The second tier, when additional monitoring results exceed the benchmark levels, is to investigate potential stormwater treatment technologies. The third tier is to develop an engineering report on the chosen treatment technology and an implementation schedule to install the treatment technology. The benchmark values in the Boatyard permit are soft limits. While limited and infrequent exceedances of the benchmarks do not require significant action, continued "exceedances" do require significant investment. This is a marked difference with the MSGP where consequences of exceeding benchmark values are very limited.

Cascade General Portland Shipyard

Cascade is located in Portland, Oregon on a 60-acre site adjacent to the Willamette River. Cascade holds an NPDES permit associated with discharge from the dry docks. The permit restricts discharge of dry dock stormwater to surface water "until such time as the permittee demonstrates that the discharge from outfall 002 does not exhibit toxicity." Due to this condition Cascade collects all dry dock stormwater and process water in a 1 million gallon tank. After treatment Cascade discharges the effluent into the sanitary sewer. General yard stormwater discharges at the facility are covered by the Oregon Industrial Stormwater General Permit (1200-Z) (a separate NPDES permit) (Oregon 2007). The Oregon Industrial Stormwater General Permit does not contain stormwater limits but does have benchmarks that are, in-effect, soft limits. If over time benchmark values are exceeded "the department will revoke the permit registrant's coverage under this permit and will require the permit registrant to apply for an individual permit." Cascade does not anticipate that they would consistently achieve benchmark values and voluntarily opted into Oregon's superfund clean-up program for stormwater, which includes upland stormwater and near shore sediment concerns. Cascade, per this risk based program, is currently conducting pilot tests using infiltration, permeable asphalt, engineering controls, and

treatment. Cascade did have a Stormwater Management Inc.¹. StormFilter treatment unit installed to treat stormwater from a 5 acre area. While the unit reduced metals by about 20 percent it did not decrease effluent toxicity. The most likely long term stormwater management solution will be infiltration, although this decision is not yet final (Source: personnel communication with T. Alan Sprott, Cascade General, 5/10/07). Even though Cascade does not discharge dry dock stormwater, they are authorized a mixing zone per their NPDES permit. Point of compliance for WET results is the edge of the corresponding (acute or chronic) mixing zone boundary.

Electric Boat Shipyard

The Electric Boat Shipyard is a General Dynamics business. Electric Boat provides design, construction, and support of submarines for the U.S. Navy. Electric Boat holds NPDES permit # CT0003824 primarily for discharges from their dry docks. NPDES coverage for general yard stormwater is via Connecticut's General Permit for the Discharge of Stormwater Associated with Industrial Activity. Under this permit monitoring is required for 10 parameters including toxicity. The associated value for each parameter was statistically derived by Connecticut based on previously submitted stormwater results. It is not specifically a benchmark, but rather a cutoff value to determine future monitoring frequency.

National Steel and Shipbuilding Company

NASSCO, a General Dynamics company, holds NPDES permit CA0109134 issued by the California Regional Water Quality Control Board. The permit prohibits the discharge of the first flush of storm water runoff directly into San Diego Bay from high risk areas unless toxicity standards are achieved. In the context of this permit the first flush is defined as the first one-inch of rainfall during the storm event. This effectively requires NASSCO to collect all stormwater. The probability of exceeding the first flush volume criteria is low. From April thru November the total average monthly precipitation is less than one inch. San Diego's annual average total precipitation is 9.97 inches (<http://cdo.ncdc.noaa.gov/climatenormals/clim84/CA/CA893112.txt>). The probability of the mean number of days that precipitation will exceed one inch is two days in a year (source: <http://cdo.ncdc.noaa.gov/climatenormals/clim20/ca/047740.pdf>). All dry dock stormwater is collected. NASSCO currently diverts both dry dock and yard stormwater to the San Diego Metropolitan Sanitary Sewer System. Although NASSCO discharges stormwater to the sanitary sewer the Water Quality Control Board states "the possibility exists for industrial storm water discharges to occur." The Board reiterates in the NPDES permit that "the acute toxicity specifications in the General Shipyard Permit will remain in effect for all industrial storm water discharges." The required acute toxicity standard for discharge of industrial stormwater is as follows:

In a 96-hour static or continuous flow bioassay test, the discharge shall not produce less than 90% survival, 50% of the time, and not less than 70% survival, 10% of the time, using a standard test species and protocol approved by the Regional Board.

NASSCO did test a large scale Storm Water Management Inc., StormFilter (leaf compost media) filter in the 2001 timeframe. The system was somewhat successful in meeting the acute toxicity standard noted above.

¹ Stormwater Management Inc., is now part of CONTECH Stormwater Solutions Inc., www.contech-cpi.com

The current stormwater diversion system has a storage capacity of 33,858,000 gallons which is well in excess of any standard statistical based storm event capacity such as a 10-year, 24-hour event and discharges into the sanitary sewer.

Washington Industrial Stormwater General Permit

This Washington State Department of Ecology permit is titled The Industrial Stormwater General Permit, A National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Stormwater Discharges Associated with Industrial Activities (Washington 2007). The scope of the Washington Industrial Stormwater General Permit is similar to that of EPA's MSGP. While it applies to a wide variety of industrial facilities, it does not apply to shipyards (as opposed to Boatyards), which are issued individual permits. The current permit became effective on 21 August 2002 (and subsequently modified on 1 December 2004), and Ecology is in the process of issuing a renewed permit. Ecology issued a Public Notice Draft permit on February 20, 2007. The focus of this section is the Public Notice Draft as it provides an indication of the direction Ecology is heading with stormwater permitting.

Similar to the Boatyard General Permit the Industrial General permit has a tiered response when stormwater monitoring results exceed benchmark and/or "action level" values. Action levels and benchmarks are conceptually similar in that they set threshold levels that, if exceeded, require the facility to take efforts to reduce pollutant loadings into stormwater. Action levels were "introduced to the permit in 2004 in response to a legislative mandate to enforce an adaptive management approach into the permit. Action levels, similar to benchmarks, were intended to be indicator values. For the heavy metals (copper, lead, and zinc) action levels were calculated as the benchmark value plus one standard deviation (as derived from California's highway runoff program data)." (EnviroVision 2006)

The tiered response is tied to whether the benchmark or action level is exceeded is summarized below:

- **Level One**

Each time a sampling result is above a benchmark value the Permittee shall: conduct a site inspection within two weeks of receipt of sampling results. Inspection results and remedial actions taken should be summarized and placed with the SWPPP and reported to Ecology.

- **Level Two**

If any two sampling results for one parameter exceed an action level, or are outside the action level the Permittee shall: identify the potential sources of stormwater contamination that are causing or contributing to the exceedance of the elevated parameter. Investigate and select all applicable and appropriate options for capital BMPs and operational source control BMPs to reduce stormwater contaminant levels to or below benchmark values. Complete installation/construction of the additional capital BMPs. Prepare and submit a report to Ecology.

- **Level Three**

If any four samples for the same parameter exceed an action level in effect at the time of the sample, or two samples exceed an action level after completion of BMPs identified in the Level Two, the permittee shall: Conduct a comprehensive study to identify the sources of stormwater contamination that are causing exceedances of the action level value; investigate and select all

applicable and appropriate stormwater capital BMPs and operational source control BMPs to reduce stormwater contaminant levels to or below benchmark values; investigate and select all applicable and appropriate stormwater treatment BMPs to reduce stormwater contaminant levels to or below benchmark values; prepare and submit a report to Ecology; and implement corrective action within 12 months.

- **Level Four**

Following completion of Level Three Corrective Actions, if any two (2) samples for the parameter exceed the action levels, the Permittee shall: Prepare an engineering report in to include:

- analysis to reduce concentrations for the pollutant of concern below the benchmark value,
 - A water quality analysis to predict, using Ecology- or EPA-approved models, whether the discharge will comply with the Water Quality Standards
- A sampling and analysis plan, and a quality assurance and project plan; prepare and submit a Level Four report to Ecology; and complete all actions within 12 months. Upon Ecology's approval or conditional approval of the report, the Permittee shall implement the report. After approval of the engineering report, the Permittee may request a waiver from implementing stormwater treatment BMPs if the facility is not discharging to a 303(d)-listed water body for the parameter of concern in the discharge.

While NAVFAC Northwest did not review the details how Ecology developed action levels, there seems to be a possible logical flaw. As noted the action levels for heavy metals are benchmarks values plus one standard deviation. The standard deviation value was derived from California's highway runoff program data. The two data sets (California's highway runoff program data and benchmarks) are independent datasets. Applying the standard deviation from one dataset to another independent dataset is incorrect.

Norfolk Naval Shipyard

Norfolk Naval Shipyard is located in Portsmouth Virginia and holds NPDES Permit VA0005215 issued by the Virginia Department of Environmental Quality. Discharges are primarily into the Elizabeth River with limited discharge into Paradise Creek. Of Norfolk's eight dry docks five are operational at this time. The permit addresses both dry dock and general yard stormwater discharges. The Table 2 tri-butyl tin (TBT) limit only applies for vessels in dry dock containing TBT coatings. Additionally, the permit requires capture of the first flush of stormwater, defined as the first one-half inch of rainfall, for vessels with TBT coatings.

Toxicity testing is required for both dry dock and stormwater discharges. While there are no toxicity limits on discharged stormwater testing is required. If results exceed a set benchmark value Norfolk must reexamine the effectiveness of the SWPPP and make changes as necessary. While this does not reach the level of a soft limit it does relay that Virginia is concerned about stormwater toxicity and may impose, in the future, more defined toxicity benchmarks or limits.

Todd Pacific Shipyards Corporation

Todd, located in Seattle, holds NPDES permit WA-000261-5 issued by Ecology. Stormwater from an in-use dry dock is collected, treated, and discharged into the sanitary sewer. General yard stormwater is also collected and discharged into the sanitary sewer. The permit specifies

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capture of a first flush of a storm volume which equated to the volume from a 10-year storm (3.1 inches of rainfall). The limits in Table 2 are in the event of an emergency discharge to surface water since Todd does not allow stormwater to discharge directly into surface water but a mechanical failure and/or extreme rainfall event could lead to an emergency discharge. Instead, Todd collects stormwater primarily in on-site detention tanks and in low gradient areas of the yard. The driver in collecting stormwater and discharging it into the sanitary sewer was the copper limit.

The permit does have provisions to conduct an Effluent Mixing Zone Study and a Receiving Water and Effluent Study to further characterize effluent discharges into surface water. Results of the study, if conducted, could positively alter permit limits. Todd has elected not to conduct these studies at this time. The selected option to discharge into the sanitary sewer was deemed more viable. A similar stormwater collection/discharge into the sanitary sewer is generally the approach that both boatyards and shipyards in Washington have chosen when feasible.

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Table 2: Numeric Permit Limits

Facility	PSNS&IMF	Ecology Boatyard General Permit (Washington 2005)	Ecology Industrial Stormwater General Permit (Washington 2007)	EPA MSGP (EPA 2000)	Cascade General Portland Shipyard	Electric Boat Shipyard	NASSCO – General Dynamics	Norfolk Naval Shipyard	Todd Shipyard
Parameter									
Copper (ug/l)	19 Avg, 33 Max [DD] NS, NL [SW]	229 [SW benchmark]	14 [SW benchmark] 23.8 [Action level]	64 [SW benchmark]	230 Max [DD] 100 [SW benchmark]	72 Max [DD] S, NL [SW]	Sanitary sewer [SW, DD]	335 Max [DD] S, NL [SW]	Sanitary sewer [DD] 5.78 Max [SW]
Lead (ug/l)	NS, NL [DD] NS, NL [SW]	NS, NL	178 [SW benchmark] 355 [Action Level]	82 [SW benchmark]	150 Max [DD] 400 [SW benchmark]	210 Max [DD] S, NL [SW]	Sanitary sewer [SW, DD]	100 Max [DD] S, NL [SW]	Sanitary sewer [DD] 221 Max [SW]
Zinc (ug/l)	NS, NL [DD] NS, NL [SW]	NS, NL	109 [SW benchmark] 218 [Action level]	117 [SW benchmark]	1,000 Max [DD] 600 [SW benchmark]	1400 Max [DD] S, NL [SW]	Sanitary sewer [SW, DD]	765 Max [DD] S, NL [SW]	Sanitary sewer [DD] 95 Max [SW]
Oil & Grease or TPH (mg/l)	10 Avg, 15 Max [DD] NS, NL [SW]	6 [SW, benchmark]	15 [SW benchmark] 30 [Action level]	15 [SW benchmark]	10 Max [DD] 10 [SW benchmark]	10 Avg, 15 Max [DD] S, NL [SW]	Sanitary sewer [SW, DD]	S, NL [DD] S, NL [SW]	Sanitary sewer [DD] 5 Max [SW]
Total Suspended Solids (mg/l)	NS, NL [DD] NS, NL [SW]	21 [SW, benchmark]	NS, NL, Turbidity: 25 [SW benchmark] 50 [Action level]	100 [SW benchmark]	50 Max [DD] 130 [SW benchmark]	S, NL [DD] S, NL [SW]	Sanitary sewer [SW, DD]	S, NL [DD] S, NL [SW]	Sanitary sewer [DD] 45 Max [SW]
TBT (ug/l)	NS, NL [DD] NS, NL [SW]	NS, NL	NS, NL	NS, NL	20 Max [DD] NS, NL [SW]	NS, NL [DD] NS, NL [SW]	Sanitary sewer [SW, DD]	0.05 Max [DD] NS, NL [SW]	Sanitary sewer [DD] NS, NL [SW]
WET testing	NS, NL [DD] NS, NL [SW]	NS, NL	NS, NL	NS, NL	S, L [DD] NS, NL [SW]	S, L [DD] S, NL [SW]	Sanitary sewer [SW, DD]	S, NL [DD] S, NL [SW]	Sanitary sewer [DD] NS, NL [SW]

DD..... Dry Dock: NPDES permit limits associated with dry dock discharges of stormwater
SW Stormwater: Non-dry dock (general yard area) associated discharges.
WET..... Whole Effluent Toxicity
TBT..... Tri-butyl tin
TPH..... Total Petroleum Hydrocarbons
NS Not Sampled/monitored
NL Not limited (no permit limit)
S Sampling/monitoring required
L Limit, Permit limit in effect

Stormwater Benchmarks

While “benchmarks” are consistently used in stormwater permits they may be applied differently depending on the specific stormwater permit and the permit issuing authority. Some of these differences are highlighted as it pertains to a specific permit in other sections of the report. Broader context application/implications of benchmarks are discussed below.

The stormwater permits evaluated in this report, and generally all stormwater permits, contain chemical-specific benchmark concentrations or values. A permittee that is required to monitor stormwater must compare results to benchmark concentrations included in their permit. Generally if results are below benchmarks you can reduce monitoring frequency. There are notable differences among permits (permit authorities) if results are above benchmark values.

Most states have adopted/use EPA’s benchmark values in their permits. The most notable exception is Connecticut, which uses a statistically derived benchmark based on state historic stormwater monitoring results. For metals Oregon has set benchmarks based on water quality standards and a dilution factor of five. Washington’s benchmarks are based on water quality standards roughly in the same manner that EPA used in the draft 2006 MSGP (EPA 2006). However, the benchmarks are adjusted for water hardness levels generally encountered in Washington.

Oregon and Washington impose similar requirements if benchmarks are consistently exceeded. In Oregon the permittee must conduct a “rigorous review to determine the cause of a benchmark exceedances, but it must also submit an Action Plan for approval [to the state] that outlines the results of that review and corrective actions it will take to meet benchmarks.” (Oregon 2006) The Washington requirements are described in the section Washington Industrial General Permit as is the concept and implementation of Action Levels. Table 3 summarizes benchmark values in the permit discussed above.

Table 3: Benchmark Values

Permit	EPA MSGP (EPA 2000)	Connecticut General Permit for the Discharge of Stormwater Associated with Industrial Activity (Connecticut 2003)	Oregon Industrial General Permit (Oregon 2007)	Ecology Draft Industrial General Stormwater Permit (Action Level) (Washington 2007)
Total Copper	63.6 ug/l	100 ug/l	100 ug/l	11.9 (23.8) ug/l
Total Lead	81.6 ug/l	50 ug/l	400 ug/l	178 (355) ug/l
Total Zinc	117 ug/l	500 ug/l	600 ug/l	109 (218) ug/l
Benchmark Basis	WQS	State stormwater data ²	WQS ³	WQS

² These benchmarks are for facilities in operation prior to 1997. The permit has a different set of benchmarks for newer facilities.

³ “Benchmarks for copper, lead and zinc were developed using the acute standards and a dilution of 5.”

Best Management Practices (BMPs)

All permits reviewed require the development and implementation of Stormwater Pollution Prevention Plans (SWPPP). All SWPPP requirements are similar. The SWPPP must include BMPs which are schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs can be categorized as operational, source control, and treatment BMPs. All permits require standard operational and source control BMP such as:

- Blasting and Painting Areas
- Drydock Activities
- Employee Training
- Engine Maintenance and Repair
- General Yard Areas
- Good Housekeeping
- Inspections
- Management of Runoff
- Material Handling Areas
- Materials Storage Areas
- Minimizing Exposure
- Preventative Maintenance
- Sediment and Erosion Control
- Spill Prevention and Response

The Ecology Boatyard General Permit is unique in that BMPs are more specific, including:

- Use of Vacuum Sander – A vacuum sander or rotary tool meeting minimum performance standards shall be used for all paint removal where a sander is appropriate. Non-vacuum grinders are prohibited. Vacuum Sanding is clearly defined/specified in the permit.
- In-Water Vessel Maintenance and Repair - Cleaning, repair, modifications, surface preparation or coating of any portion of a vessel's hull while the vessel is afloat is prohibited.

Other permits evaluated are less specific regarding BMPs; however, the Todd Shipyards permit, an Ecology issued permit, is more specific and directive in the nature and tone of the BMPs. The title of BMPs in the permit includes:

- Control of Large Solid Materials
- Control and Cleanup of Paint Dust and Abrasive Blasting Debris
- In-Water Vessel Maintenance – Surface Preparation BMPs
- In-Water Vessel Maintenance – Paint and Coating Application BMPs
- BMPs for Floats used for In-Water Vessel Maintenance:
- Documentation Requirements for In-Water Vessel Maintenance BMPs
- Oil, Grease, and Fuel Spills Prevention and Containment
- Paint and Solvent Use and Containment
- Contact Between Water and Debris

- Maintenance of Hoses, Soil Chutes, and Piping
- Bilge and Ballast Water
- Chemical Storage
- Recycling of Spilled Chemicals and Rinse Water
- Identification of Pollutant Sources
- Education of Employees, Contractors, and Customers
- Sewage and Gray Water Discharges Prohibited

Each of these BMPs includes specific language not just a directive to implement a BMP on the subject. For instance the BMP – Control and Cleanup of Paint Dust and Abrasive Blasting Debris requires the following: Photographs shall be taken and maintained in a logbook to demonstrate the condition of the drydock floor prior to launching a vessel. Documentation accompanying the photographs shall include the name of the vessel, the drydock number, the date the vessel was launched, the date the photograph was taken, and the name of the photographer. A videotape that documents the same information may be used in place of a photograph collection.

Interestingly the NASSCO permit states “the discharger shall develop and implement an adequate BMP Program that achieves BAT/BCT [Best Available Technology Economically Achievable/Best Conventional Pollutant Control Technology].” The level of treatment required is not typically expressed in permits. BAT is applicable to toxic pollutants such as metals. Since NASSCO collects all stormwater and disposes of it into the sanitary sewer it could be reasonably concluded that BAT is in-fact achieved since the discharge (at least directly to surface water) is eliminated.

Advanced stormwater treatment BMPs such as a Stormwater Management Inc.’s StormFilter system were generally installed for research and development purposes not for long-term stormwater treatment. The qualitative feedback NAVFAC Northwest received on these systems is that they should not be expected to achieve toxicity or copper benchmarks. A report summarizing a series of reports on compost media filtration (StormFilter) indicates that these systems can achieve toxicity benchmarks/limits and may reduce total copper to or below 200 ug/l (Lenhart 2003). These systems were tested at PSNS&IMF, Cascade Portland Shipyard, and NASSCO. None were placed into full-scale use as an ultimate stormwater treatment method. The uncertainties in advanced stormwater treatment and the heightened liability of direct discharge into surface waters tends to drive the selected management method to collection and disposal into the sanitary sewer whenever feasible. There is also the perception that NPDES (direct discharge) limits will become more restrictive in the future. By discharging into the sanitary sewer this concern is abated.

Stormwater-related Regulatory Compliance Gaps for PSNS&IMF

There are two primary “regulatory gaps” observed for PSNS&IMF. The first is the lack of specificity in the required BMPs. While the gap is not significant when compared to permits issued outside of Washington, it is significant compared to Ecology issued permits. Even though EPA, not Ecology, is the regulatory authority and will reissue PSNS&IMF’s next permit, Ecology does have input and may request stronger BMPs. Additionally the nature and tone of BMPs have changed since the permit was last renewed in 1994, so simply the passage of time will result in a higher BMP threshold.

The second, and potentially more significant gap, is that when EPA reissues the permit they may want to impose benchmarks or possibly soft limits for discharge of stormwater from industrial areas. Of greatest concern would be benchmarks or soft limits for copper and/or toxicity. Per Table 2 the range for copper limits/benchmarks is 5.78 to 335 ug/l. The 2006 draft MSGP (EPA 2006) requires monitoring for Total Suspended Solids for Sector R facilities with a benchmark of 100 mg/l. While not likely, EPA could impose toxicity benchmarks for stormwater discharges when they renew the permit.

Generally BMPs for large shipyards (based on the Table 2 definition) are similar for those facilities evaluated. Advanced treatment BMPs are not required and there are no regulatory drivers at this point that would require installation of them. This is in marked contrast to small and medium sized shipyards on the west coast where many of them do collect stormwater for treatment and/or disposal into the sanitary sewer.

Summary and Conclusions

Table 4 summarizes some of the information previously presented. Following the table conclusions are drawn.

Table 4: Summary

Item	Comment
Copper Permit Limit Range (ug/l)	5.78 – 335
Lead Permit Limit Range (ug/l)	82 – 221
Zinc Permit Limit Range (ug/l)	95 – 1400
Tri-butyl tin	TBT is limited in two of the three large Shipyard's dry dock discharges. TBT is not limited nor is sampling required for general yard stormwater discharges for any of the shipyards.
WET	Toxicity monitoring is generally required for dry dock discharges including those that contain stormwater. Permit limits are generally imposed. This is not the case with general yard stormwater. Virginia does impose toxicity monitoring but does not impose limits, only a benchmark.

1. Smaller and medium size shipyards on the west coast generally collect yard stormwater. Typically the collected stormwater is discharged into the sanitary sewer. Copper and/or toxicity limits/benchmarks/soft limits were drivers in the decision to manage stormwater in this manner. Since there are so few large shipyard in the US it is difficult to "see" any definitive trend for larger shipyards; however, it is reasonable to conclude that the trend to manage stormwater via collection will impact PSNS&IMF. A possible scenario in larger shipyards is targeted collection of stormwater for high risk areas.
2. If limits and/or benchmarks for copper, lead, or zinc in stormwater discharges are imposed, PSNS&IMF should not expect to consistently meet them. Copper is typically the most problematic.
3. The Ecology Boatyard General Permit (Washington 2005), the Oregon Industrial Stormwater General Permit (Oregon 2007), and the Ecology Industrial Stormwater General Permit (Washington 2007) include benchmark values that are in effect soft limits

for stormwater discharges. While limited and infrequent "exceedances" of the benchmarks do not require significant action, continued "exceedances" do. This is a marked difference with the MSGP where consequences of exceeding benchmark values are limited. Imposition of soft limits may become more common in the future.

4. Ecology imposes more specific/detailed BMPs in both the Boatyard General Permit and other individual NPDES permits reviewed by NAVFAC Northwest than other permits evaluated. Depending on the level of involvement and influence Ecology has in renewing the PSNS&IMF permit, they may require inclusion of detailed BMPs in the permit.
5. There is a general sense, particularly among west coast shipyards, that permit limits will be stricter in the future, and the best option is to capture and discharge stormwater into the sanitary sewer rather than conducting a mixing zone study (or related efforts) and attempt to favorably alter limits. The thought is that even if you can use BMPs to effectively achieve limits or benchmark levels, doing so may be insufficient in the future. Discharge into the sanitary sewer holds less liability and is deemed a more viable long-term compliance solution. This thought pattern is less prevalent on the east coast and generally so the larger the shipyard. Capture and discharge into the sanitary sewer is not viable in all cases and clearly would be problematic for large shipyards. In these situations infiltration to groundwater is an option, however, NAVFAC Northwest does not expect widespread use of stormwater infiltration. Cascade Portland Shipyard is considering infiltration and may employ it. As treatment technology progresses the potential exists to treat stormwater that can meet water quality standards. Nichols Brothers Shipyard is now designing a treatment system to achieve water quality standards using electrocoagulation and enhanced filtration. The primary pollutant of concern is copper. Pacific Fishermen Shipyard is also looking toward a similar solution to regulatory compliance. Direct discharge following treatment may become more common as wastewater treatment plants look toward minimizing inflow of relatively clean water so they can maintain capacity.
6. While advanced stormwater treatment BMPs can be effective at reducing toxicity and/or copper to acceptable levels, widespread acceptance and long-term use of advanced BMPs is limited. Effluent from advanced BMPs can be quite variable and the technology is not yet fully developed. As noted above discharge to sanitary sewer holds less liability and currently is the "disposal" method of choice.
7. Standard/conventional BMPs such as good housekeeping are required for all shipyards, and for the most part the BMPs are all similar.
8. In Washington, small and medium shipyards must manage the volume of stormwater generated from a 10-year, 24-hour storm event. This volume is considered AKART by Ecology. The Nichols Brother Fact Sheet states: "This permit requires upgrading the stormwater treatment facility to accommodate the 10-year, 24-hour storm event. Because this has been achieved for same source categories including other shipyards such as Pacific Fishermen, Hansen, Duwamish Shipyard, Fishing Vessel Owners Marine Ways, Puglia Engineering, and TODD Pacific, the Department has determined this to be AKART." PSNS&IMF could expect a similar requirement if stormwater collection were required.

9. There may be a trend toward structuring stormwater permits to more fully incorporate an adaptive management approach. Current permits already do incorporate an adaptive management approach thru stormwater monitoring and benchmarks to help manage practices. Ecology's use of action levels and tiered response system further drives the adaptive management trend.
10. While it is too early in the AKART Study process to estimate what is or is not AKART some conclusions can be inferred based on small and medium sized west coast shipyards.
 - Advanced stormwater treatment BMPs may not necessarily be AKART.
 - Collection of general yard stormwater is AKART.
 - Discharge of collected stormwater into the sanitary sewer is AKART.
 - It is too early to determine if discharge of collected stormwater into surface water following treatment is AKART.

How AKART would be applied to a large shipyard is a difficult question. NAVFAC Northwest would suggest that:

- Collection of general yard stormwater is not "reasonable" and would not likely be AKART.
- Targeted collection of stormwater from high risk areas such as outdoor metal cutting could be considered AKART. Discharge of that stormwater into the sanitary sewer is AKART.
- It is not clear at this point if discharge of collected and treated stormwater into surface water would be AKART.
- Segregation of "clean" stormwater, for instance segregating roof drains from industrial areas, could be considered AKART.

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